Space Weather Technical Forecast

Issued on Thursday 27 March 2025 at 01:13 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: G1/Minor storms likely, decreasing chance of G2/Moderate geomagnetic storms day 1. Chance of M-class flares (R1-R2; Minor-Moderate radio blackouts) throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity reached Moderate levels, due to an isolated M1.0-flare from AR4043 in the northeast at 26/0809 UTC. There are currently three sunspot regions on the Earth-facing solar disc, all of which are small and magnetically simple. AR4036 has rotated out of view around the northwest limb. AR4043 is the most significant of the remainder, a small but slowly growing bipolar region in the northeast. Following this , closer, to the limb, is a new unnumbered active region which appears as a simple bipolar grouping.

No clear Earth-directed CMEs were observed, though an eruption on the morning on 25th may give a slight chance of a glance on day 3 (29 Mar), though this is low confidence.

Solar Wind / Geomagnetic Activity: Solar wind parameters, as measured by DSCOVR at L1, were indicative of the arrival of a high speed stream (HSS) due to connection to CH25/+. Speeds initially slow-ambient, around 350-400 km/s, increased a little to 430 km/s by 26/1200 UTC with further increases thereafter, reaching elevated to strong levels and peaking at 730 km/s at 26/2140 UTC. Density remained largely above average, peaking at 38ppcc at 26/1049UTC. The Interplanetary Magnetic Field, Bt, was at moderate to strong levels peaking at 25nT at 26/1213 UTC. The north-south component, Bz, was also at moderate to strong levels with much variability noted between positive (northward) and negative (southward) orientation, ranging from, +21nT to -22nT. The phi angle was negative (towards the sun) until around 26/0112 UTC, when it switched to positive (away from the sun) and predominantly remained in that orientaion. Geomagnetic activity was at Quiet to G2/moderate geomagnetic storm levels (Kp 2-6), with BGS magnetometer instruments recording two G2/Moderate Storm intervals 26/1500-1800 UTC and 26/1800-2100 UTC.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 was at background levels. High energy electron flux (greater than 2 MeV) at GEO was at background to moderate levels with a peak level of 168 pfu at 26/1315 UTC . The 24-hour fluence was below the Active threshold. The observed integrated pfu was 1.8e6 at 27/0000 UTC.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Space Weather Technical Forecast

Four-Day Space Weather Forecast Summary

Solar Activity: Low to moderate solar activity is expected, with a chance of further isolated M-class flares, most probably from the active region in the northwest of the solar disc AR4043.

Solar Wind / Geomagnetic Activity: No clear Earth-directed CMEs feature in the forecast, though an eruption on 25th may give a slight chance of a glance on day 3 (29 Mar), although this is low confidence.

Solar winds starting the guidance period at elevated to strong levels on day 1 (27 Mar), due to the HSS releated to the unusually prominent positive coronal hole feature CH25 which dominates a large portion of the southern hemisphere. Solar winds gradually waning towards slightly elevated levels on days 3 and 4 (29 and 30 Mar).

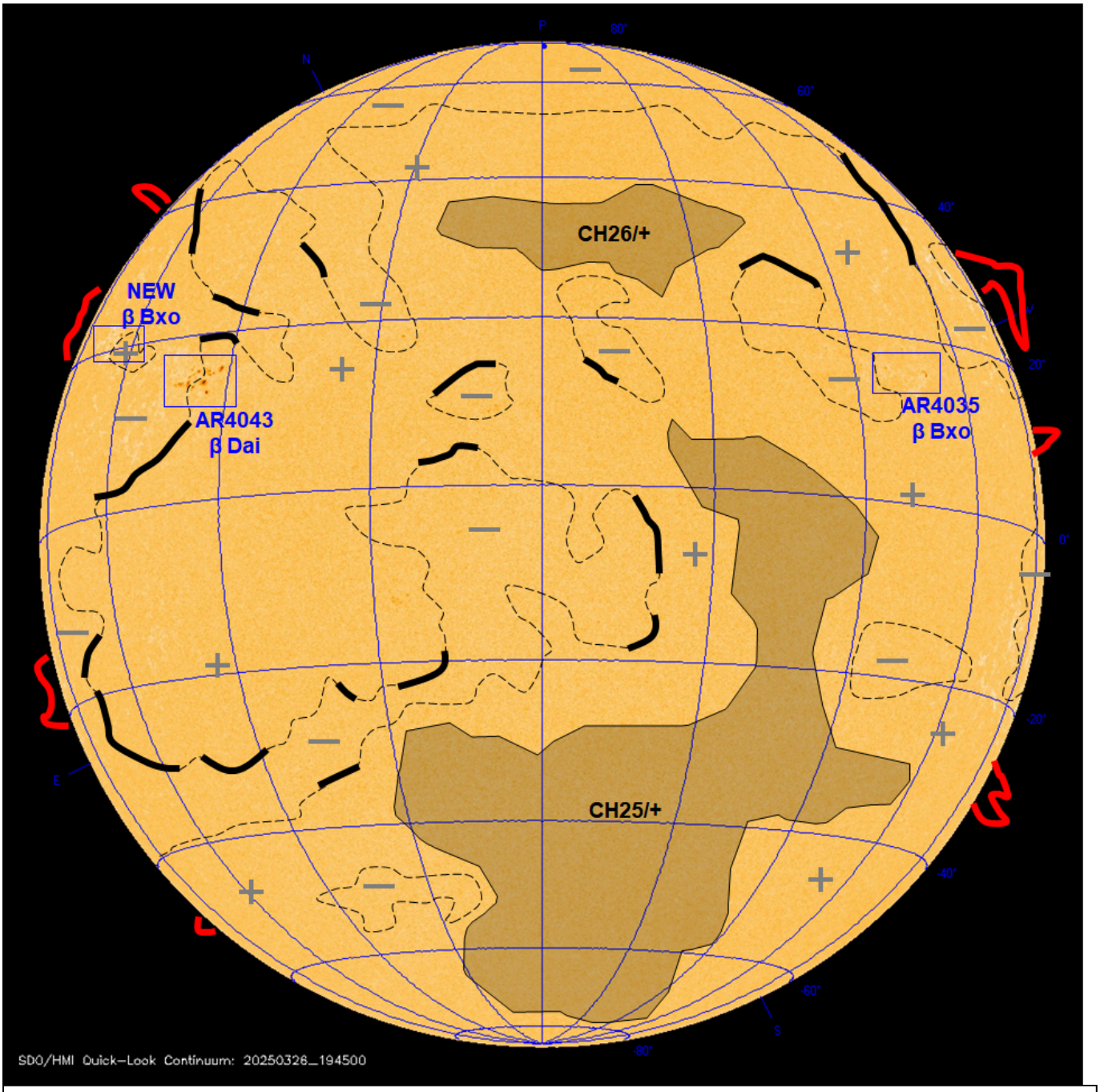
Active to G1/Minor storm (Kp4-5) geomagnetic levels, with a chance of further G2/Moderate (Kp6) storms at first on day 1 (27 Mar) due to coronal hole influences, before easing later day 3 into day 4 (29/30 Mar), becoming generally Quiet to Unsettled (Kp2-3) by the end of the period.

Energetic Particles / Solar Radiation: High energy proton flux is expected to be at background levels, with a a negligible chance of enhancement from any larger flares. High energy electron flux is expected to continue at largely background to moderate levels until later in the period, when it may become diurnally high. Electron (1e8 integrated pfu) fluence should remain below the Active threshold throughout the period.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 1: MOSWOC Solar Synoptic Map valid 26/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Geomagnetic Storms

There are no clear Earth-directed CMEs in the forecast at present, though an eruption on 25th may give a slight chance of a glance on day 3 (29 Mar), although this is low confidence.

During the previous rotation solar winds reached around 800 km/s for a time and this would probably occur in the next few hours. Both the MOSWOC Enlil output and SWPM are considered to be providing good guidance, with a weighting toward persistence given a similar structure to this coronal hole was observed on the last rotation. Solar winds starting the guidance period at elevated to strong levels on day 1 (27 Mar), due to the HSS releated to the unusually prominent positive coronal hole feature CH25 which dominates a large portion of the southern hemisphere. Solar winds gradually waning towards slightly elevated levels on days 3 and 4 (29 and 30 Mar). During the first day of the period (27 Mar) Active to G1/Minor storm (Kp4-5) geomagnetic levels will continue, with a chance of further G2/Moderate (Kp6) storms at first on day 1 (27 Mar) due to coronal hole influences. During the rest of the period geomagentic activity will most likely ease through day 3 into day 4 (29/30 Mar), becoming generally Quiet to Unsettled (Kp2-3) by the end of the period.

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	90	70	30	10
Strong	G3	No	20	10	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R⊙ (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed (km/s)	Estimated Arrival Time (UTC)	Comments
25/1741 UTC	Partial	Filament eruption	SE	1300 km/s	29/0600 UTC	Low confidnce as modelled on limited availability of imagery.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 2: MOSWOC ENLIL with a couple of CMEs departing the western limb wrt Earth.

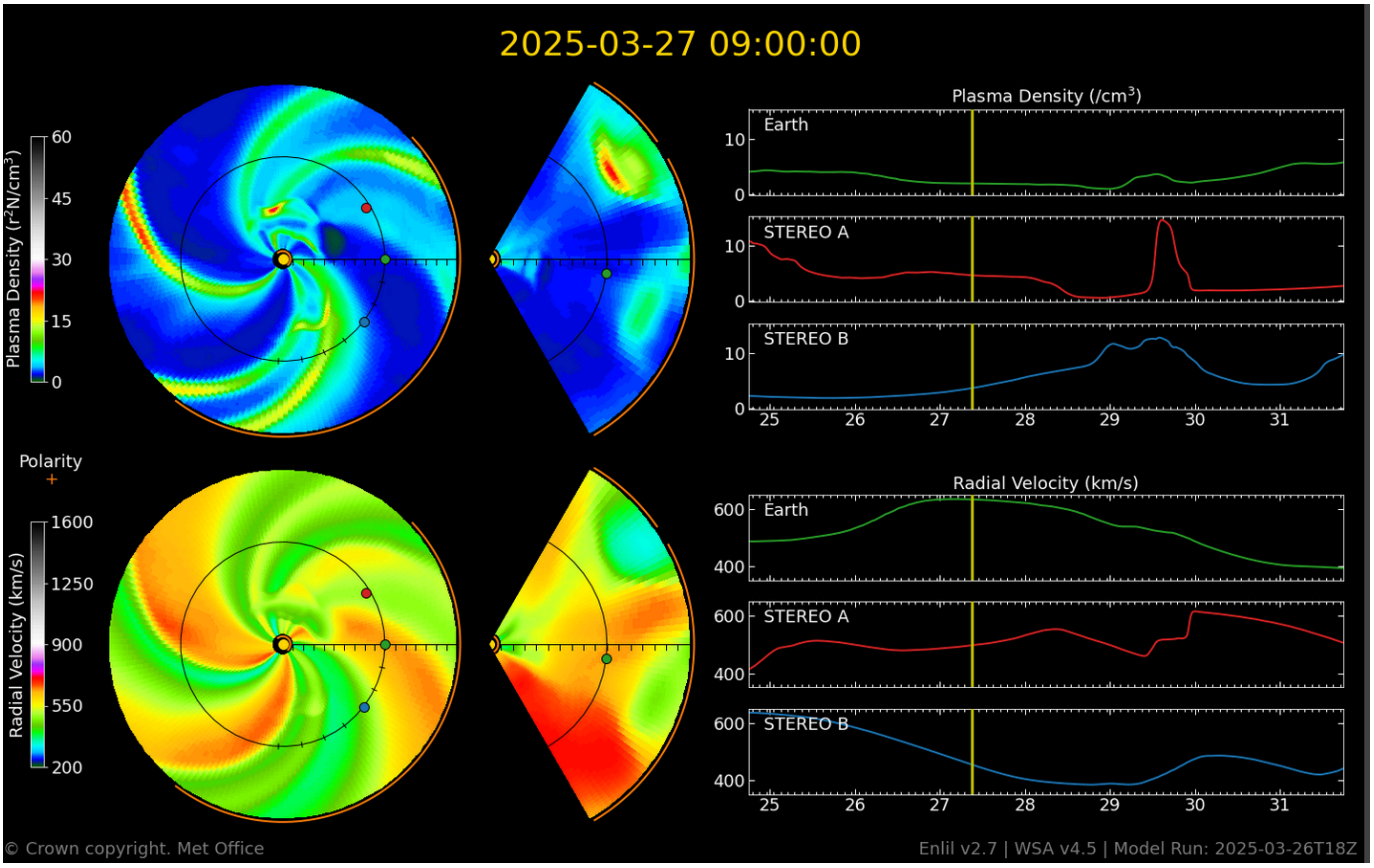
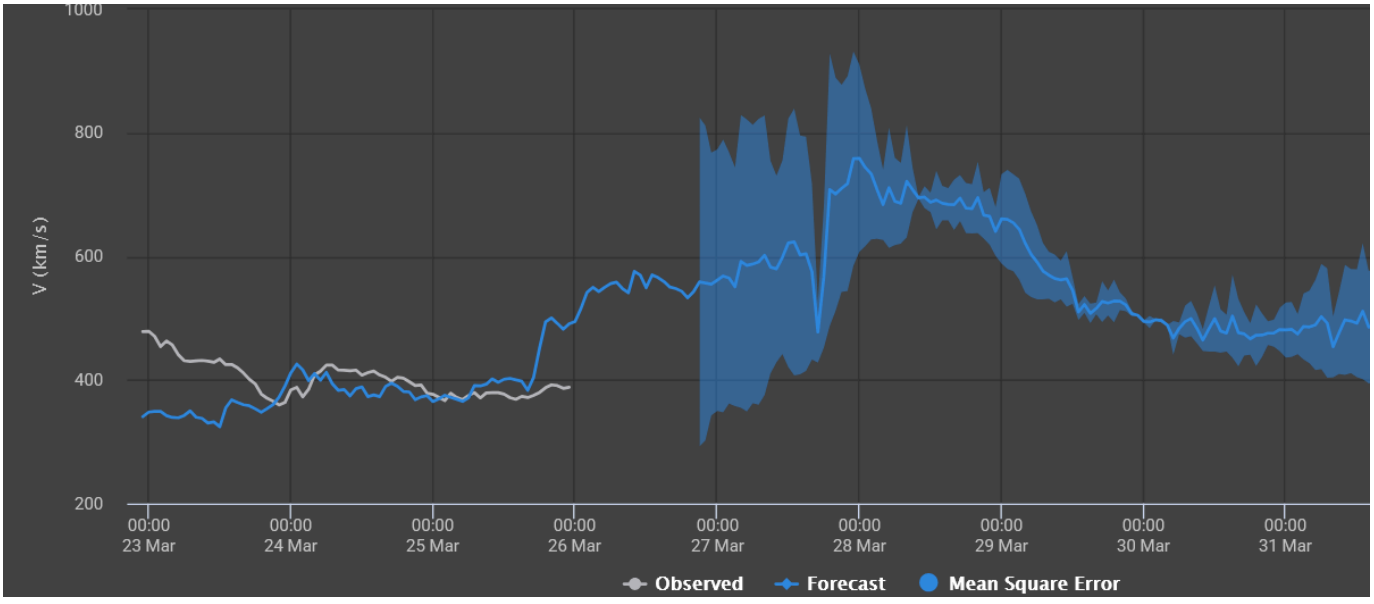


Figure 3: MOSWOC Solar Winds Prediction Model



© Crown Copyright 2025. All Rights Reserved.

Radio Blackouts - X-Ray Flares

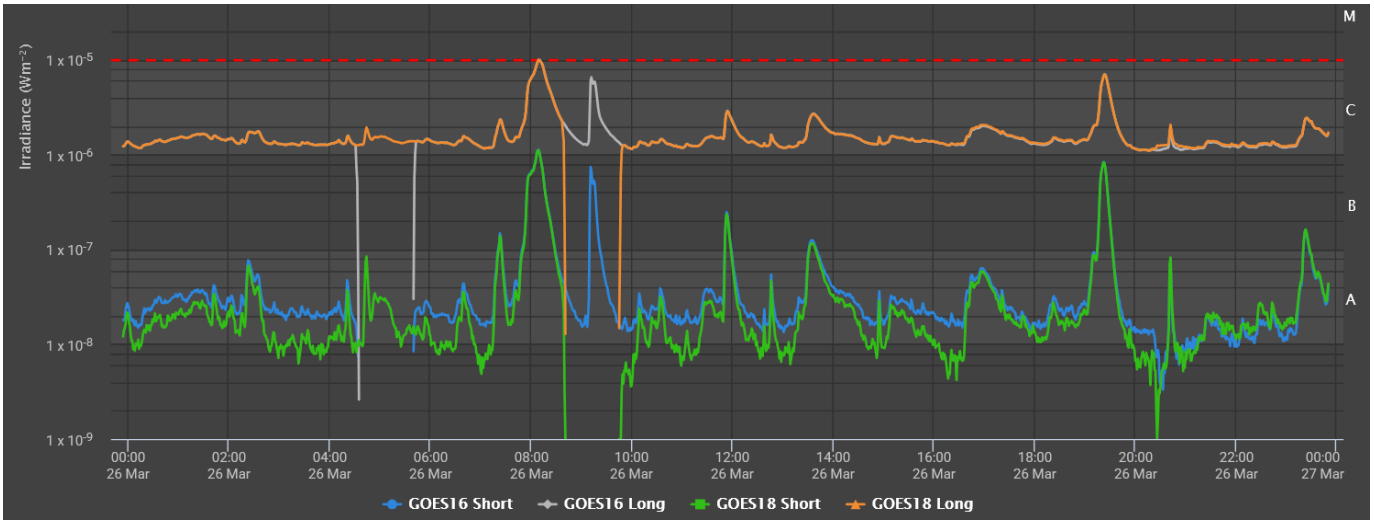
Solar activity reached Moderate levels, due to an isolated M1.0-flare from AR4043 in the northeast at 26/0809 UTC.

Three sunspot regions cover the Earth-facing solar disc, all of which are small and magnetically simple. AR4036 has now rotated out of view around the northwest limb. AR4043 is the most significant region, a still relatively small but slowly growing bipolar region in the northeast. A new simple bipolar region is developing near the northeast limb.

Low to moderate solar activity is expected, with a chance of further isolated M-class flares. Probabilities for M-class flares, in the table below, have been raised a little, later in the guidance period, in anticipation of a couple of returning active regions which should rotate into view across the eastern limb.

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	30	30	40	50
Very Active	R3-R5 (X Class)	No	1	1	1	5

Figure 4: X-ray flux at GEO with several C-class flares and one reaching M-class from AR4043.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

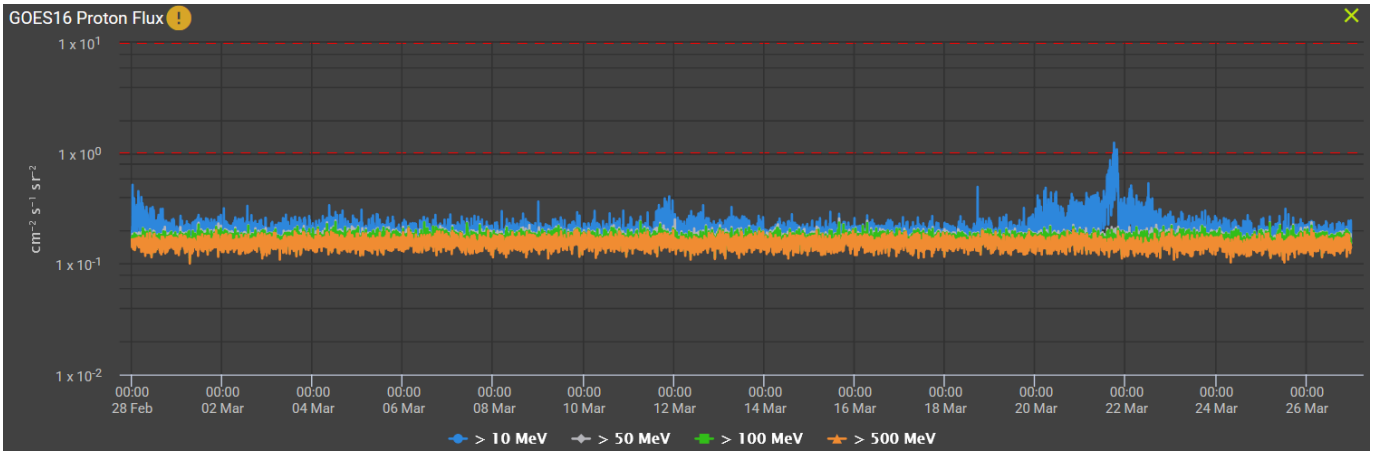
© Crown Copyright 2025. All Rights Reserved.

Solar Radiation Storms (High Energy Protons)

GOES18 high energy (>10MeV) proton flux was at background levels. Proton flux is expected to remain at background levels, with a negligible chance of enhancement due to the current lack of large, complex spot groups on the Earth facing disc.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Figure 5: Proton flux at GEO over the past 27 days.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

High Energy Electrons (≥ 2MeV)

GOES16 High energy (>2MeV) Electron flux has been at background to moderate levels. With a chance of enhanced geomagnetic activity due to the HSS from CH25+ at the start of the period, the Van Allen belt is likely to be suppressed away from GEO and electron flux is therefore expected to remain at background to moderate levels for the first couple of days. However, as the geomagnetic activity wanes on days 3 and 4 (29 and 30 Mar), the charged electron belts should expand back towards GEO, with a probable significant rise in the flux of high energy electrons.

Electron (1e8 integrated pfu) fluence should remain below the Active threshold throughout the period. MOSWOC REFM output is indicating that the electron fluence should remain below the Active threshold throughout the period, with a rising trend and is considered reasonable guidance with moderate confidence.

GEO Electron Environment	Level ($cm^{-2}sr^{-1}$ day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1×10^{8}	No	1	1	20	50
Very Active	≥ 2 MeV ≥ 1×10^{9}	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

© Crown Copyright 2025. All Rights Reserved.

Figure 6: High energy electron flux at GEO and MOSWOC REFM electron fluence forecast/observations/recurrence over the past week.

© Crown Copyright 2025. All Rights Reserved.